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**BIOLOGY AND IMMATURE MORPHOLOGY OF THE STILETTO FLIES
DIALINEURA LEHRI ZAITZEV, 1977 AND *PANDIVIRILIA SAPPONENSIS*
(MATSUMURA, 1916) (DIPTERA, THEREVIDAE)**

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Summary. Data on biology and immature stages of *Dialineura lehri* Zaitzev, 1977 and *Pandivirilia sappoensis* (Matsumura, 1916) are given for the first time. Pupa of *D. lehri* and larva of *P. sappoensis* are described. The former species develops in soil and the latter species develops in the wood dust of deciduous trees and is common in tree holes.

Key words: Diptera, Therevidae, *Dialineura lehri*, *Pandivirilia sappoensis*, larva, pupa, Russian Far East.

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Резюме. Впервые получены данные по биологии и преимагинальным стадиям *Dialineura lehri* Zaitzev, 1977 и *Pandivirilia sappoensis* (Matsumura, 1916). Описаны куколка *D. lehri* и личинка *P. sappoensis*. Первый вид развивается в почве, а второй – в древесной трухе лиственных пород деревьев и наиболее обычен в дуплах.

INTRODUCTION

Family Therevidae includes more than 30 Palearctic species in two subfamilies, Phycinae and Therevinae. Data on the biology of the stiletto flies are not complete. Therevidae are predators and prefer dry substrates for the development. The typical external character of the larvae is long body with secondary segmentation of abdominal segments, strongly sclerotized but not invaginated head with short cranium and long metacephalic rod. Pupa differs in the presence of two caudal spine-like projections (Krivosheina, 1964; Hennig, 1968; Irwin, Lyneborg, 1981). The descriptions of immature stages were represented in several publications (Irwin, 1972; Irwin & Lyneborg, 1981; Webb & Irwin, 1989; Krivosheina, 2011, 2012a). Biology of several species in desert was described by Krivosheina (2012b).

While the key to larvae of the lower Brachycera was provided recently (Krivosheina Krivosheina, 2015) the problem of discovering immature characters at the genera level in Therevidae appeared because of the new Nearctic and Palearctic genera (previously considered as *Thereva* sensu lato) were described (Lyneborg, 1968, 1983; Lyneborg & Zaitzev,

1980; Irwin & Lyneborg, 1981). The larvae of the genus *Pandivirilia* and pupa of the genus *Dialineura* are described below for the first time.

DESCRIPTION OF IMMATURE STAGES OF THE SUBFAMILY THEREVINAЕ

Genus *Dialineura* Rondani, 1856

NOTES. This genus is widely distributed in the Palaearctic, Oriental, Neotropical and Australian Regions. Ten species are known from Palaearctic Region, mainly in Japan, China, and Russian Far East (Zaitzev, 1971, 1977, 1986; Lyneborg, 1989). Biological data and morphology of pupa were known for *D. aurata* Zaitzev, 1971 (Zaitzev, 1986). This species developed in wood rot of tree hole of old oak and in wood rot of cut cedar pine trunk on the territory of Ussurijskii and Lazovskii Nature Reserves (Primorskii krai).

Dialineura lehri Zaitzev, 1977

Figs 1–8

MATERIAL EXAMINED. **Russia:** Primorskii krai, Sokolchi, Lazovskii Nature Reserve, in soil, 14.VII 1979, 1 pupa, 1 male (coll. A.V. Kompantzev).

DESCRIPTION. Pupa. Body size 11 mm. Antennal sheaths are situated at the same horizontal line in the anterior part of cephalothorax (Fig. 1). Antennal sheaths massive, with apical pointed spine and light tubercle near its base. Such light tubercle judging by the literature data on the pupae from other genera is typical for the representatives of the subfamily Therevinae. Body end with two elongate diverging spines posited on broad round tubercles (Fig. 8). Fore legs are situated almost at the level of apices of the wing sheaths, however mid and hind legs protrude beyond the wing sheath margin.

Body segments with many short pointed spines and long setae. Spines are situated on the dorsal side of pupa and setae — on the ventral side. Spines are relatively short and equal in size on dorsal part of abdominal segments II and VII (Figs 4, 8). Dorsal side of abdominal segments III–VI with short spines in the middle and with 2 long spines at margins (Fig. 5). Ventral side of abdominal segment II with 3 symmetrical pairs of long setae (Fig. 1), ventral side of abdominal segment III–IV with 2 median short setae and 4 long setae laterally from them (Fig. 6). Lateral sides of abdominal segments with 3 long setae (Fig. 7).

Spiracles are situated at the apex of elongate tubercle on lateral side of prothorax and abdominal segments I–VII (Figs 2, 3). Stigmal plate of prothoracic spiracles with 8 spiracular chambers, of abdominal spiracles — maximally with 7 chambers.

NOTES. The species was described from Primorskii krai (Zaitzev, 1977). One male of this species was reared from fruiting body of fungus (Zaitzev, 1986), but immature stages were not described.

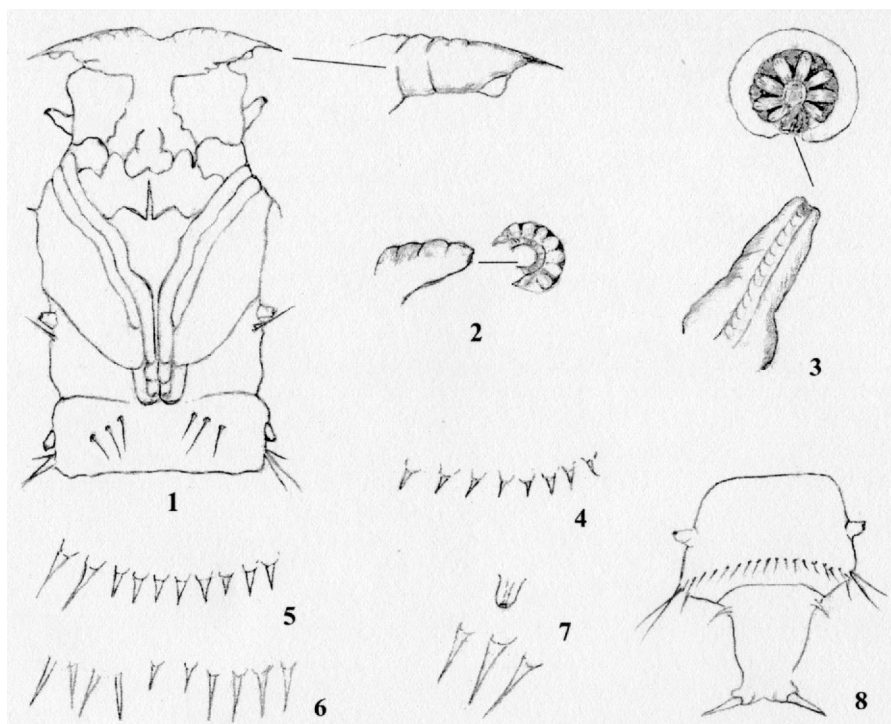
Genus *Pandivirilia* Irwin et Lyneborg, 1981

NOTES. There are 9 Palaearctic and 7 Nearctic species in this genus, five of them are distributed in Europe, including *P. eximia* (Meigen, 1820) known from European part of Russia. Two species, *P. amurensis* Lyneborg, 1986 and *P. sapporensis* (Matsumura, 1916), are known from East Palaearctic region, including Russian Far East.

Pandivirilia sapporensis (Matsumura, 1916)

Figs 9–17

MATERIAL EXAMINED. **Russia:** Primorskii krai, Sokolchi, Lazovskii Nature Reserve, 20.VI 1979, N 71, 1 larva, 1 male, imago emerged 3.IV 1980 (coll. N.P. Krivosheina); the same locality, in the hole of maple, 22.VII 1979, N 357, 1 larva, 1 female, imago emerged 31.III 1980 (coll. N.P. Krivosheina).



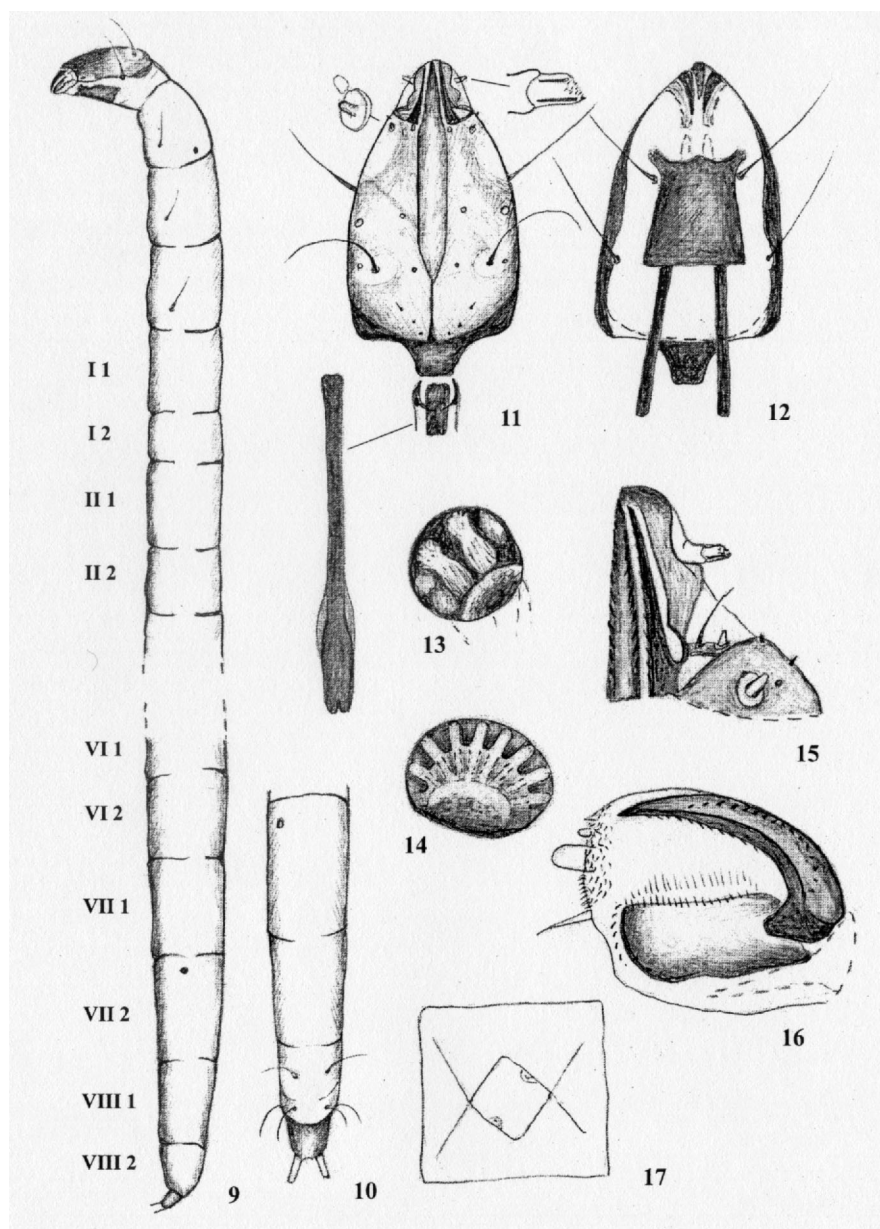
Figs. 1–8. Pupa of *Dialineura lehri*. 1 – cephalothorax ventrally; 2 – anterior (prothoracic) spiracle; 3 – abdominal spiracle; 4,5 – dorsal setae of abdominal segments II and III; 6,7 – ventral and lateral setae of abdominal segment III; 8 – end of the body.

DESCRIPTION. Larva. Body length 34 mm. Abdominal segments are divided each in two unequal rings (Fig. 9). Ultimate abdominal segment with terminal support carrying 2 finger-like projections (Fig. 10).

Head capsule brown, with black posterolateral folds and massive median protuberance. Light spots are situated on lateral side of cranium in anterior part of head and around dorsal setae (Fig. 11). Large lateral sensory pits situated in median part of head are not surrounded by light areas of integument what is typical for larvae of the genus *Thereva* Latreille, 1796. Anterior part of metacephalic rod is a little broadened. Metacephalic rod is 1.2 times as long as the head.

Ventral plate of head is elongate, longer than wide (Fig. 12). Anterolateral projections of ventral plate well developed, lateral sides of plate without significant notch behind them.

Antennae are attached to anterolateral corner of the head capsule, almost 1.5 times as long as wide. Labrum and mandibles are approached, narrowed and pointed apically (Fig. 15). Surface of labrum ribbed. Distal mandibular sclerite with many small dents, basal sclerite of mandible with a row of light hairs on apical margin (Fig. 16). Maxilla with two-segmented palpus. Apical segment 1.5 times as long as wide, obliquely cut, with several papillae (Figs 11, 15). External margin of maxilla with massive transparent papilla and a long seta (Fig. 16). Transverse sclerite of maxilla, cardo, with one long and one short seta (Fig. 15). Parts of



Figs. 9–17. Larva of *Pandivirilia sapponensis*. 9 – general view of the body, lateral; 10 – end of the body, dorsal; 11, 12 – head capsule (cranium) dorsally and ventrally; 13, 14 – prothoracic and abdominal spiracles; 15 – labrum, mandible and maxilla dorsally; 16 – dorsal and basal mandibular sclerites against the background of anterior part of maxilla; 17 – pattern on lateral side of anterior rings of abdominal segments I–VII

labium are significantly reduced, with the exception of small palpus attached to small light plate. Some authors (Irwin, Lyneborg, 1981) considered ventral plate of the head capsule – postmentum – as the part of labium, but the position, the structure and the size of this sclerite are more likely correspond to be a part of the head capsule.

Thoracic segments are of almost equal size. Their length is almost 1,5 times as large as their width. Abdominal segments consist of two rings of different size. Anterior ring is 2 times as long as the posterior one on abdominal segments I-II; the relation of the length of anterior and posterior rings reaches 2:1.5 on abdominal segments III-IV and 1:1 on abdominal segments VI-VIII. Lateral sides of anterior rings of abdominal segments I-VIII with deep narrow furrows arranged like rhombus (Fig. 17); however such structures are typical for the representatives of several other genera.

Dorsal and lateral setae of head well developed, relatively long: dorsal setae on the posterior part of head almost as long as the width of head. Two ventral setae situated under anterior protuberances of ventral plate are of the same length. Two small dorsal setae present in anterior part of the head capsule. Two approached sensory pits and two pairs of very short setulae are located at the base of the head capsule. Median part of head with 2 light sensory pits near dorsal setae and two more medially from them.

Thoracic segments with 1 pair of long lateroventral setae (Fig. 1). Long setae present also on the posterior ring of the ultimate abdominal segment in front of the terminal support: 2 dorsal ones in the middle of the ring and 2 pairs of dorsolateral ones at the end of the ring on partially isolated fascia.

Spiracles are of typical shape: anterior (prothoracic) spiracles round with 2 elongate light chambers (Fig. 13), abdominal spiracles oval with 8 chambers (Fig. 14).

BIOLOGY. Larvae are typical inhabitants of wood dust mainly in tree holes of deciduous trees (oak, nut, maple). According to many discoveries of the larvae and pupae in Primorskii krai this species is common in broadleaved woodlands of the Russian Far East. The larvae settle wood together with Tipulidae and Alleculidae larvae and feed on their pupae.

NOTES. This species was described from Japan (Hokkaido). In Russia it was recorded from Amurskaya oblast (Zeja River) and Primorskii krai (Lazovskii Nature Reserve) as *Pandivirilia atra* Lyneborg and its pupa was very briefly described under this wrong name (Zaitzev, 1986). *Pandivirilia sappoensis* is also known from Sakhalin and Honshu islands (Lyneborg, 1986; Nagatomi & Lyneborg, 1989).

CONCLUSION

Larvae of the family Therevidae are very close in the structure of the body. It is possible now to discuss the differences in morphology at the subfamily level only. The larvae of *Actorthia* Kröber, 1912 and *Ruppellia* Wiedemann, 1830 (subfamily Phycinae) has rounded body end without finger-like projections and secondary rings of abdominal segments are not distinguished in length (Krivosheina, 2011, 2012a). As for subfamily Therevinae – all known before larvae possess well developed terminal support carrying 2 finger-like projections and secondary rings of abdominal segments are of different length. Further investigations are necessary to discover distinct larval characters of the general and species level are necessary to discover distinct larval characters of the general and species level.

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